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Michael HELD Sebastian Alois PRÜM	)	Art Unit: 2854
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	)	Examiner: Ren Luo Yan
Application No. 10/555,091	)	
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Filed November 2, 2005	)	
	)	
For ROTARY FOLDER COMPRISING A CUTTING DEVICE FOR CROSS-CUTTING AT LEAST ONE WEB	)	
	)	

SUBMISSION OF VERIFIED TRANSLATION OF PRIORITY DOCUMENT

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

Submitted herewith is a verified English language translation of the German language text of DE 103 19 774.5, filed May 2 2003. The certified copy of DE 103 19 774.5 has been received in the subject U.S. application from the International Bureau, as indicated in the Office Action Summary of October 9, 2008. Submission of the verified English language translation is being submitted to perfect applicant's claim to the filing date of May 2, 2003 of the DE 103 19 774.5 application.

Entry of the verified translation into the file of the subject U.S. patent application is respectfully requested.

Respectfully submitted,

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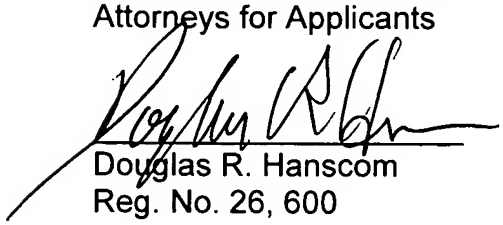

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DECLARATION

The undersigned, Karin T. Dunn, hereby states that she is well acquainted with both the English and German languages and that the attached is a true translation to the best of her knowledge and ability of the German text of patent application DE 103 19 774.5, filed on 5/2/2003.

The undersigned further declares that the above statement is true; and further, that this statement was made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or document or any patent resulting therefrom.

Karin T. Dunn

Specification

Rotary Folder Comprising a Cutting Device for Cross-Cutting at Least One Material Web

The invention relates to a wheel folding apparatus with a cutting device for the transverse cutting of at least one web of material in accordance with the preamble of claim 1.

Such a wheel folding apparatus is employed, for example, in order to separate paper webs imprinted in a web-fed rotary printing press into individual signatures by means of the cutting device, and to fold the signatures.

Known wheel folding devices of this type comprise cutting devices with a transport cylinder and a cutting cylinder, which are mutually rotatable and delimit a gap through which a conveying path for the web of material to be cut extends. The cutting cylinder supports at least one cutter, which cuts respectively one signature off the web of material when it passes through the gap.

DE 25 17 000 C2 shows a folding apparatus with a spur cylinder and a cutting blade cylinder, which form a single cutting gap.

DE 35 27 710 A1 and EP 0 627 310 A1 disclose folding apparatus, wherein two folding blade cylinders work together with a folding jaw cylinder. A single cutting cylinder is assigned to each one of these folding blade cylinders.

The object of the invention is based on creating a wheel folding apparatus with a cutting device for the transverse cutting of at least one web of material.

In accordance with the invention, this object is attained by means of the characteristics of claim 1.

The advantages which can be obtained by means of the invention lie in particular in that with little outlay for apparatus it makes possible the combining of two webs of material, which are fed to the cutting gaps on two transport carriages, into a common product, or that it allows the processing of a web of material with a very large number of layers by combining two partial webs.

The processing of webs of material composed of a large number of layers by means of a folding apparatus with a single cutting gap, such as described in DE 25 17 000 C2, entails difficulties for several reasons. For one, traction rollers, which are customarily provided for setting a required tension in the web of material, directly act only on the respectively outermost layers of the web of material; their force is only indirectly transmitted to the inner layers by virtue of friction of the layers of material against each other. These frictional forces are not accurately controllable, in particular if it is necessary to guide the web around curves, i.e. to loop it around a roller. Therefore the tension of the inner layers of such a web is harder to control, the greater the number of webs is. Also, the forces required for processing a web, be it during cutting or pushing the spur points into the web, are all the greater, the greater the number of layers is. With the wheel folding apparatus in accordance with the invention it is possible to combine a product with a defined number of pages from partial webs, which have been cut separately of each other and placed on the spur points, if applicable. Since the forces required for cutting these partial webs and, if required, for placing them on spur points, are less than the corresponding forces when processing a single web with the defined number of pages, the wheel folding apparatus can be constructed lighter and therefore more cost- effectively than a conventional wheel folding apparatus, without any loss in quality.

Further advantages consist in that the cutting device eliminates the danger of re-cutting already separated signatures in the course of a further passage through a cutting gap,

without requiring elaborate shifting devices, or an extraordinarily high degree of precision when controlling the rotations of the individual cylinders of the cutting device for this.

To prevent the second cutting blade from again cutting through the first web during the passage through the second cutting gap, the rotation of the two cutting cylinders is preferably synchronized in such a way that during its passage through the second cutting gap the second cutting blade engages a cut created by the first cutting blade in the first web.

To make the engagement with this cut easier, means are preferably provided for moving apart the cut edges of the first web generated by the first cutter in the course of cutting it, so that during its passage through the gap the second cutter encounters a gap of non-vanishing width in the first web.

In an embodiment of the wheel folding apparatus, in which the cutting cylinder in the cutting device also takes on the function of a transport cylinder for the separated products, a single signature is located between the two cutters by which it has been cut as long as it is maintained on the cutting or transport cylinder, and it is sufficient during this time that the cutters and the signature do not move in relation to each other, in order to assure that the signature is not cut again in the course of another passage through a cutting gap.

Exemplary embodiments of the invention are represented in the drawings and will be described in greater detail in what follows.

Shown are in:

Fig. 1, a schematic lateral view of a portion of a wheel folding apparatus with a cutting device;

Figs. 2 to 5, respectively partial sectional views of the transport cylinder and of one cutting cylinder in different embodiments of the invention;

Fig. 6, a schematic lateral view of a portion of a different embodiment of a wheel folding apparatus with a cutting device;

Fig. 7, an enlarged representation of a detail in Fig. 6;

Fig. 8, a representation of a mode of operation;

Fig. 9, a representation of another mode of operation.

A schematic lateral view of a portion of a wheel folding apparatus is represented in Fig. 1. This wheel folding apparatus has two inlets 01, 02 for multi-layered webs 03, 04 of material, in particular paper webs 03, 04, which will be called inner or outer web 03, 04 in what follows. The two webs 03, 04 pass through respective traction roller pairs 06, 07 for setting their tension, and meet a transport cylinder 11 at the respective height of cutting gaps 08, 09 between the transport cylinder 11 on the one hand and one of the cutting cylinders 12, 13 on the other. Instead of two inlets 01, 02 and two cutting gaps 08, 09 it is also possible to provide three or more. In the course of this, the webs 03, 04 preferably first make contact with the respective cutting cylinder 12, 13 and subsequently with the transport cylinder 11, i.e., the webs 03, 04 loop first around the cutting cylinder 12, 13 and then the transport cylinder 11.

Each cutting cylinder 12 or 13 has a circumference corresponding to at least one, preferably two lengths of the signatures 21, 27 to be produced from the webs 03, 04, and supports two cutters 14.

The circumference of the transport cylinder 11 corresponds to more than five, in particular seven lengths of the signature 21, 27. Seven counter-cutting strips, for example hard rubber strips, inserted at equal distances into the circumferential face of the transport cylinder 11, are used as stops 33, each of which works together with a cutter 14 when cutting the webs 03, 04. A holding device 16 is arranged at the transport cylinder 11 adjoining each one of the stops 33, for example a spur strip 16 with extendible spur needles 23 (see Figs. 2 to 5).

In the position represented in Fig. 1, a cutter 14 of the cutting cylinder 12 and a stop 33 of the transport cylinder 11 just pass through the cutting gap 08 and in the process cut the inner web 03. The leading edge of the inner web 03 created during the cutting is speared on the spur needles 23 of a spur strip 16 which had been extended immediately prior to reaching the cutting gap 08, and continue to hold it firmly on the surface of the transport cylinder 11 during further transport.

The signature 21 cut off from the inner web in this way 03 is further conveyed on the transport cylinder 11 to the cutting gap 09, where the outer web 04 is placed on top of it and is also speared by the spur needles 23 of the spur strip 16.

The rotation of the two cutting cylinders 12, 13 is synchronized in such a way that a cutter 14 of the cutting cylinder 13 always passes through the cutting gap 09 simultaneously with a small gap between two successive signatures 21 cut from the inner web 03 and a stop 33. Different techniques for creating this gap will be explained in what follows with the aid of Figs. 2 to 5.

In the example represented here, the angular distance between the two cutting gaps 08, 09 is approximately 50°. This angular distance can differ from the angular distance of the spur strips

16 from each other (51.5°) or a multiple thereof, so that cutting is not performed simultaneously at both cutting gaps 08, 09; even a half-number multiple of this value is disadvantageous from the point of view of avoiding vibrations.

Following the passage through the cutting gap 09, each spur strip 16 supports a total product, which is respectively composed of a signature 21 cut off the inner web 03 and a signature 27 cut off from the outer web 04. Seven products are created with each revolution of the transport cylinder 11, the same as if both webs 03, 04 had been brought along in the customary manner via a common inlet 01, 02. But since the cutting off of each individual signature 21, 27 is spread over two cutting steps at the cutting gaps 08, 09, the force which must be employed in each cutting step is less, and a satisfactory, even running of the machine can be more easily maintained.

Furthermore, two cylinders 17 and 18, in particular folding rollers 17 and 18 which together form a gap 19, in particular a folding gap 19, have been placed in a contactless manner against the transport cylinder 11. Seven folding blades, not represented in Fig. 1, are attached to the transport cylinder 11, each of which is extended when reaching the folding gap 19 between the transport cylinder 11 in order to push the products transported on the transport cylinder 11 in a manner known per se into the folding gap 19, leading with a desired fold line located approximately centered on the sides of the signatures 21, 27, and to fold them in this way. The folded products pass through the folding gap 19 and, in a known manner, fall onto a paddle wheel, not represented, and are placed by it on a conveyor belt.

Fig. 2 shows a detailed view of the cutting gap 09 and its surroundings in accordance with a first embodiment of the invention. Two of the seven spur strips 16 of the transport cylinder 11 are represented in Fig. 2 and identified as spur strips 16', 16". Each of them is pivotable around a shaft 22 in a controlled manner and has spur needles 23 which are oriented in such a way that

their respective tips extending from the circumference of the transport cylinder 11 are farther away from the center of the shaft 22 than their bases located inside the transport cylinder 11. The spur needles 23 of the spur strip 16' are in a comparatively far extended position, in which they have also previously passed through the cutting gap 08. This identical position is shown by dashed lines at the location of the spur strip 16".

In comparison with this, the spur strip 16" has been pivoted back some distance into the interior of the transport cylinder 11. This pivoting movement causes a displacement of the intersection point between the spur needles 23 and the surface of the transport cylinder 11 opposite the direction of rotation of the latter. By means of this displacement the signature 21 held by the spur strip 16" is slightly shifted opposite the direction of rotation of the transport cylinder 11 in comparison with the position in which it was cut off the inner web 03 in the cutting gap 08. Following the passage through the cutting gap 09, the spur strip 16" returns to the position shown in dashed lines, or even changes to a further extended position in order to cancel, or overcompensate, the rear displacement of the signature 21 in this way. A small gap 26 is created in this way between the signature 21 and a signature 27 which has been cut off immediately prior to this, into which the cutter 14 can extend and in this way press the outer web 04 against the stop 33 and sever it, without the danger arising of again cutting one of the signatures 21, 27.

Fig. 3 shows an alternative embodiment of the transport cylinder 11 and the cutting cylinder 13 in a partial sectional view analogous to that of Fig. 2. In connection with each cutter 14, the cutting cylinder 13 has a strip 28, which projects past its outer circumference and which passes through the cutting gap 09 respectively shortly ahead of the associated cutter 14. A complementarily shaped groove 29 in the transport cylinder 11 is located opposite the strip 28 during each gap passage, so that the strip 28 presses a trailing edge area of the signature 27 cut off the inner web 03, as well as the outer web 04, into the groove 29. The trailing edge of the signature 27 is pulled ahead by this, and the gap 26 is opened. Therefore, with this embodiment it is not necessary for the spur strip 16" to pivot outward again after its passage through the cutting gap 09 for creating the gap 26.

A third embodiment is represented in Fig. 4, again by means of a partial sectional view through the transport cylinder 11 and the cutting cylinder 13. The cutting cylinder 13 is identical to the one in Fig. 2, the transport cylinder 11 differs by the arrangement of the shafts 22 around which the spur strips 16 are pivotable. While in the embodiments in accordance with Figs. 2 and 3 these shafts 22 are located ahead of the spur needles 23 in the direction of rotation of the

transport cylinder 11, they are arranged behind these in the embodiment of Fig. 4. The orientation of the spur needles 23 in relation to the surface of the transport cylinder 11 is the same in all cases, they are slightly inclined forward in the direction of rotation of the transport cylinder 11 in respect to the normal surface line, so that a tension acting on the material speared on the spur needles 23 keeps them pressed against the surface of the transport cylinder 11.

A changed course of the pivot movement of the spur strips, here identified by 16*, 16**, results from the changed arrangement of the shafts 22. The spur strip 16*, which is still far distant from the cutting gap 09, is in a position in which it is comparatively little extended, in which its spur needles 23 extend far enough past the circumference of the transport cylinder 11 for holding the inner web 03. The spur strip 16* is farther extended only shortly before reaching the cutting gap 09 in order to also puncture the outer web 04, which can be perceived at the spur strip 16**. With this embodiment the upward movement of the spur needles 23 causes a shifting of their intersection with the circumference of the transport cylinder 11 opposite the direction of movement of the latter and therefore a movement of the leading edge of the signature 21 held by the spur strip 16** away from the impact point of the cutter 14 on the stop 33. In contrast to

this, the spur needles 23 of the spur strip 16*** are retracted a short distance into the transport cylinder 11 in order to thus move the signature 27 they are holding forward in the circumferential direction and in this way to open the gap 26 at the height of the stop 33.

With this embodiment several direction changes of the movement of the spur needles 23 in the course of a revolution of the transport cylinder 11 are avoided.

A fourth embodiment of the cutting device is represented in Fig. 5, again in a plan view analogous to Fig. 4.

In this embodiment, segments 32', 32" ..., are arranged on the circumference of the transport cylinder 11 respectively between two successive spur strips 16', 16", 16"', ... , for increasing the circumference. Each one of these segments 32', 32" is composed of a plurality of flexible disks, which are arranged side-by-side in the axial direction of the transport cylinder 11 and are spaced apart by gaps. In the course of passing the finished cut signatures 21, 27 on to the folding rollers 17, 19, these gaps are used as outlet openings for tines of a folding blade (not represented). The ends of each of the disks are anchored on head strips 31 which can be shifted in the circumferential direction of the transport cylinder 11.

The segment 32' is in a configuration wherein the course of its disks corresponds to the cylindrical shape of the transport cylinder 11. After such a segment 32' has passed through the cutting gap 09, its head strips 31 are shifted toward each other, so that its disks form a protrusion extending beyond the circumference of the transport cylinder 11, as shown by means of the segment 32". Because of this protrusion, the distance between the spur strips 16" and 16"', measured along the surface of the transport cylinder 11, is greater than the one between the spur strips 16' and 16", the latter corresponding to the length of the signatures 21, 27

created at the cutting gap 08. Therefore the bulging of the segment 32" causes the creation of the gap 26 between the signatures 21 and 27, into which the cutter 14 of the cutting cylinder 13 can extend.

The cutting cylinder 13 is arranged on the circumference of the transport cylinder 11 so that it cuts in a phase-shifted manner.

The cut of the cutting cylinder 12 on the transport cylinder 11 takes place close to, in particular 10 mm, next to the other cut of the cutting cylinder 13.

The cutting cylinders 12 and 13 are arranged in the circumferential direction on the transport cylinder 11.

Fig. 6 shows a schematic lateral view of a portion of an alternative embodiment of the wheel folding apparatus, wherein the cutters 14 are arranged on the transport cylinder 11. The circumference of the cutting and transport cylinder 11 corresponds to more than five, preferably seven lengths of the signatures 21, 27. It supports more than five, preferably seven cutters 14 evenly distributed over its circumference and, in its movement direction (rotation in a counterclockwise direction in Fig. 1), a holding device 16, for example a spur strip 16, closely behind each cutter 14. Such a spur strip 16, which is pivotable around a shaft 22 and carries spur needles 23, is represented enlarged in Fig. 7 at the moment of its passage through the cutting gap 08 in the counter cylinder 34.

Each one of the two identically constructed counter cylinders 34 or 36 has a circumference corresponding to at least one, preferably two lengths of the signatures 21, 27 to be produced from the webs 03, 04. It supports at least one, preferably two counter-cutting strips, for example hard rubber strips, sunk into its circumferential surface, which are used as stops 33 for the cutter 14 in cutting the webs 03 or 4, as well as a groove 24 closely behind each stop 33 for

receiving the tips of the spur needles 23 of the spur strips 16 which have been extended past the circumference of the cutting and transport cylinder 11 during the passage through the cutting gap 08 or 09.

In the position represented in Fig. 6, a cutter 14 of the cutting and transport cylinder 11 and a stop 33 of the counter cylinder 34 just pass through the cutting gap 08 and in the process cut through the inner web 03. The leading edge of the inner web 03 being created by cutting is speared on the spur needles 23 of a spur strip 16, which has been extended shortly before reaching the cutting gap 08, which continue to hold it firmly on the surface of the cutting and transport cylinder 11, even during further transport.

The signature 21 cut off the inner web 03 in this way is further conveyed on the cutting and transport cylinder 11 to the cutting gap 09, where the outer web 04 is placed on top of it, is also speared by the spur needles 23 of the spur strip 16 and is cut by the same cutter 14. Since the cutters 14 and the spur strips 16 do not move in relation to the cutting and transport cylinder 11 between their passage through the cutting gap 08 and the cutting gap 09, there is no danger that the signatures 21, which are cut off the web 03 in the cutting gap 08, will be cut again during their passage through the cutting gap 09.

At the location of the cutting gaps 08 and 09, the tips of the spur needles 23 (see Fig. 7) extend farther past the circumference of the cutting and transport cylinder 11 than the cutters 14 in order to assure that they already have penetrated through the web 03 or 04 before the latter are cut by the cutter 14.

The angular distance between the two cutting gaps 08, 09 is approximately 50° in the

example represented here. This angular distance can differ from the angular distance of the spur strips 16 from each other (51.5°) or a multiple thereof, so that cutting is not performed simultaneously at both cutting gaps 08, 09; even a half-number multiple of this value is disadvantageous from the point of view of avoiding vibrations.

Following the passage through the cutting gap 09, each spur strip 16 supports a total product which is respectively composed of a signature 21 cut off from the inner web 03 and a signature 27 cut off from the outer web 04. Seven signatures 21, 27 are created with each revolution of the transport cylinder 11, the same as if both webs 03, 04 had been brought along in the customary manner via a common inlet 01, 02. But since the cutting off of each individual signature 21, 27 is spread over two cutting steps at the cutting gaps 08, 09, the force which must be employed in each cutting step is less, and a satisfactory, even running of the machine can be more easily maintained, and the demands made on the mechanical load-bearing capability of the cutting device are less than if they were fed in via a common inlet 01, 02.

Furthermore, at least five, preferably seven folding blades, which are not represented in the drawing figure, are attached to the cutting and transport cylinder 11 and which, each time they reach a folding gap 19 between two folding rollers 17 and 18 placed in a contactless manner against the cutting and transport cylinder 11, are extended for transferring the products transported on the cutting and transport cylinder 11 into the folding gap 19 in a manner known per se, and fold them. The folded products pass through the folding gap 19 and, in a known manner fall onto a paddle wheel, not represented, by which they are placed on a conveyor belt, which is also not represented since it is known.

A modified embodiment of the cutting device differs from the one represented in Fig. 6 in that it has only a single inlet 02 for a single web 04 to be cut. Reference is made to Fig. 6

in describing it, wherein the inlet 01, the web 03 and the counter cylinder 34 are assumed not to exist.

It is possible that each one of the webs 03, 04 has identical patterns A and B one behind the other, i.e. in the transport direction. These patterns A and B are preferably printed by at least one forme cylinder of a printing unit, which carries two identical patterns A or B on its circumference. The webs 03, 04 are conducted on top of each other, so that signatures with patterns A and B resting on top of each other are created, each of which is moved to the folding gap 19. To this end it is not absolutely necessary for the transport cylinder 11 to have an odd division and instead it can also have an even division, preferably greater than 4 or 6.

Preferably each of the patterns A, B, C, D identifies two newspaper pages, wherein A1, A2; B1, B2; C1, C2; D1, D2 each identify one newspaper page. At least one web 03, 04 is to be understood by the identification web 03, 04, however, preferably this is to be understood as a continuous web consisting of several webs 03, 04 placed on top of each other.

In this case the webs 03, 04 can each be imprinted by forme cylinders of printing units which either have a pattern A or B on the circumference (single circumference), or two patterns A or B on the circumference (double circumference). In the case of double circumference forme cylinders, two identical patterns A, A and B, B, or two different patterns A, B can be arranged on the circumference.

Therefore four modes of operation are possible when employing the wheel folding apparatus in accordance with the invention.

In a first and second mode of operation, both webs 03, 04 are brought together upstream of the first inlet 01 on the transport cylinder 11 and are cut by means of a single cutting process.

In a first mode of operation, the webs 03, 04 here have the same patterns A or C, as can be seen in Fig. 8, and identical products are formed one behind the other on the transport cylinder 11 during each revolution and are directly delivered to the folding gap 19.

In a second mode of operation corresponding to a collection operation, the webs 03, 04 have alternating patterns A, B or C, D, one behind the other, as represented in Fig. 9, which, in the course of a first revolution, are alternatingly deposited on the transport cylinder 11 (= collection cylinder), which is provided with an odd number of fields. Fields of the transport cylinder 11, which carry signatures with patterns A, C, move past the folding cylinders 17, 18 without the signatures being delivered. During a second passage of such a field past the inlet 01 it is additionally loaded with signatures with the patterns B, D. Only then are all four signatures delivered together to the folding gap 19.

In a third and fourth mode of operation, the two webs 03, 04 are separately fed via the inlets 01, 02.

In the third mode of operation, the webs 03, 04 carry patterns A, B or C, D alternatingly one behind the other in accordance with Fig. 9.

In this case, in the course of a first revolution of the transport cylinder 11 (= collection cylinder), a field of the transport cylinder is loaded with a signature with the pattern A at the inlet 01, and with a signature with the pattern C at the inlet 02, so that every second spur strip 16 carries signatures with the patterns A, C when passing the folding cylinders 17, 18, and passes the cylinders without delivering the signatures. In the course of a second revolution, two signatures with patterns B, D from the webs 03, 04 are then again conducted on the spur strips 16.

Therefore, during the second revolution of the transport cylinders 11, signatures with patterns A, B, C, D on the spur strips 16 alternate with spur strips 16 which only carry signatures with the patterns A, C, wherein the finished products, consisting of four signatures with patterns A, B, C, D of each second field are transferred to the folding gap 19.

In a fourth mode of operation, the webs 03, 04 have the same patterns A, A, or C, C in succession, as in Fig. 8, so that during each revolution of the transport cylinders 11 each spur strip 16 picks up signatures with the patterns A, C, which are directly transferred to the folding gap 19 when it is reached.

List of Reference Symbols

01	Inlet
02	Inlet
03	Web of material; web, first; web, inner; paper web
04	Web of material; web, second; web, outer; paper web
05	-
06	Traction roller pair
07	Traction roller pair
08	Cutting gap, first
09	Cutting gap, second
10	-
11	Transport cylinder, folding blade cylinder
12	Cutting cylinder, first; counter cylinder, first
13	Cutting cylinder, second; counter cylinder, second
14	Cutter
15	-
16	Means, holding device, spur strip
17	Cylinder, folding roller
18	Cylinder, folding roller
19	Gap, folding gap
20	-
21	Signature, first
22	Shaft
23	Spur needles
24	Groove
25	-
26	Gap
27	Signature, second

28 Strip

29 Groove

30 -

31 Means, segment head strip

32 Means, segment

33 Stop

34 Counter cylinder, first

35 -

36 Counter cylinder, second

Claims

1. A wheel folding apparatus, having a cutting device (11, 12, 13; 11, 34, 36) for the transverse cutting of at least one web (03, 04) of material, having a transport cylinder (11) and two folding rollers (17, 18) forming a folding gap (19), wherein the transport cylinder (11) is arranged to form a first folding gap (08) together with a first counter cylinder (12, 34), characterized in that the transport cylinder (11) is additionally arranged to form a second folding gap (09) together with a second counter cylinder (13, 36).

2. The wheel folding apparatus in accordance with claim 1, characterized in that each of the counter cylinders (12, 13) is a cutting cylinder (12, 13).

3. The wheel folding apparatus in accordance with claim 1, characterized in that the transport cylinder (11) has stops (33) for the cutters (14) of the cutting cylinders (12, 13).

4. The wheel folding apparatus in accordance with claim 1, characterized in that the first counter cylinder (12, 34) works together with the transport cylinder (11) for cutting through a first web (03) of material, and the second counter cylinder (13, 36) works together with the transport cylinder (11) for cutting through a second web (04) of material.

5. The wheel folding apparatus in accordance with claim 1, characterized in that the counter cylinders (12, 13; 34, 36) are arranged on the circumference of the transport cylinder (11) for phase-shifted cutting.

6. The wheel folding apparatus in accordance with claim 5, characterized in that on the transport cylinder (11) the cut in the first cutting gap (08) takes place close to, in

particular less than 10 mm, next to a cut in the second cutting gap (09).

7. The wheel folding apparatus in accordance with claim 1, characterized in that the counter cylinders (12, 13, 34, 36) are arranged on the transport cylinder (11) offset in the circumferential direction.

8. The wheel folding apparatus in accordance with claim 1, characterized in that a first transport track for a first web (03) of material to be cut extends through the first cutting gap (08), wherein the first cutting cylinder (12) has at least one cutter (14) for cutting a first signature (21) off the first web (03) of material in the course of the passage of the cutter (14) through the first cutting gap (08), that a second transport track of a second web (04) of material to be cut meets the first transport track at the transport cylinder (11), and both transport tracks pass through the second cutting gap (09), wherein the second cutting cylinder (13) has at least one cutter (14) for cutting a second signature (27) off the second web (04) of material in the course of the passage of the cutter (14) through the second cutting gap (09).

9. The wheel folding apparatus in accordance with claim 8, characterized in that the rotation of the two cutting cylinders (12, 13) is synchronized in such a way that in the course of passing through the second cutting gap (09), the cutter (14) encounters a cut in the first web (03) of material created by the cutter (14) in the first cutting gap (08).

10. The wheel folding apparatus in accordance with claim 9, characterized by means (16, 16', 16", 16*, 16**, 16***, 31, 32', 32") for moving apart the cut edges created by the

first cutter (14) in the course of cutting the first web (03) of material.

11. The wheel folding apparatus in accordance with claim 10, characterized in that the means (16, 16', 16", 16*, 16**, 16***, 31, 32', 32") for moving apart the cut edges comprise a holding device (16", 16**) for holding the cut-off first signature (21) and for shifting the first signature (21) opposite the transport direction prior to reaching the second cutting gap (09).

12. The wheel folding apparatus in accordance with claim 10 or 11, characterized in that the means (16, 16', 16", 16*, 16**, 16***, 31, 32', 32") for moving apart the cut edges comprise a holding device (16"', 16***) for holding the cut-off second signature (27) and for shifting the second signature (27) in the transport direction after the passage through the second cutting gap (09).

13. The wheel folding apparatus in accordance with claim 1, characterized in that the transport cylinder (11) supports at least one cutter (14).

14. The wheel folding apparatus in accordance with claim 13, characterized in that each of the counter cylinders (12, 13, 34, 36) has a stop (33) working together with the cutter (14).

15. The wheel folding apparatus in accordance with claim 13 or 14, characterized in that a first transport track for a first web (03) of material to be cut extends through the first cutting gap (08), that a second transport track for a second web (04) of material to be cut meets the first transport track at the transport cylinder (11), and both transport tracks pass through the second cutting gap (09).

16. The wheel folding apparatus in accordance with claim 1, characterized by a first counter cylinder (34), which is rotatable together with the transport cylinder (11) and delimits the first cutting gap (08), through which a first transport track for the first web (03) of material extends, wherein the transport cylinder (11) supports at least one cutter (14) for cutting a signature off the first web (03) of material in the course of the passage of the cutter (14) through the first cutting gap (08), and the counter cylinder (34) has a stop (33) working together with the cutter (14), wherein the transport cylinder (11) has a holding device (16) for holding a cut off signature and transporting the signature through the first cutting gap (08), and that the first transport track loops around the first counter cylinder (34) in the entry to the first cutting gap (08).

17. The wheel folding apparatus in accordance with claim 10, 11, 12 or 16, characterized in that the holding device (16, 16', 16", 16*, 16**, 16***) is a spur strip (16, 16', 16", 16*, 16**, 16***).

18. The wheel folding apparatus in accordance with claim 17, characterized in that the spur strip (16, 16', 16", 16*, 16**, 16***) which supports spur needles (23) can be pivoted around a shaft (22), and that the spur needles (23) cross the circumference of the transport cylinder (11) at a location which is changeable in accordance with the pivot position of the spur strip (16, 16*).

19. The wheel folding apparatus in accordance with claim 12 and claim 17, characterized in that the spur strip (16, 16', 16", 16*, 16**, 16***) which supports spur needles (23) can be pivoted around a shaft (22) and that the tips of the spur needles (23) are at a greater distance from the shaft (22) than their bases.

20. The wheel folding apparatus in accordance with one of claims 10, 11, 12 or 16 to 19, characterized in that the means (16, 16', 16", 16*, 16**, 16***, 31, 32', 32") for moving apart the cut edges are comprised of a radially displaceable segment (31, 32', 32") of the transport cylinder (11) and a control device for driving an outward movement of the segment (31, 32', 32") after the passage through the second cutting gap (09).

21. The wheel folding apparatus in accordance with one of claims 10, 11, 12 or 16 to 20, characterized in that the means (16, 16', 16", 16*, 16**, 16***, 31, 32', 32") for moving apart the cut edges comprise a groove (29) in the transport cylinder (11) and a strip (28) on the second cutting cylinder (13), which works together with the groove (29).

22. The wheel folding apparatus in accordance with one of claims 17 to 21, characterized in that the first counter cylinder (34) has at least one groove (24) for receiving the spur needles (23) of the spur strip (16).

23. The wheel folding apparatus in accordance with claims 13, 14 or 15, characterized in that the first transport track for a web (03) of material to be cut first loops around the first counter cylinder (34) at the entry to the first cutting gap (08).

24. The wheel folding apparatus in accordance with claim 1, characterized by a first counter cylinder (34), which is rotatable together with the transport cylinder (11) and delimits the first cutting gap (08), through which a first transport track for the first web (03) of material extends, wherein the transport cylinder (11) supports at least one cutter (14) for cutting a signature off the first web (03) of material in the course of the passage of the

cutter (14) through the first cutting gap (08), and the counter cylinder (34) has a stop (33) working together with the cutter (14), wherein a second transport track for a second web (04) of material to be cut meets the first transport track at the transport cylinder (11), and that a second counter cylinder (36) is rotatable together with the transport cylinder (11) and together with the latter delimits a second cutting gap (09) through which both transport tracks pass, wherein the second counter cylinder (36) has a stop (33) which, for cutting a second signature off the second web (04) of material, works together with the cutter (14) in the course of the passage of the cutter (14) through the second cutting gap (09).

25. The wheel folding apparatus in accordance with one of the preceding claims, characterized in that the transport cylinder (11) has at least five, preferably seven fields.

26. The wheel folding apparatus in accordance with one of the preceding claims, characterized in that an inlet (01, 02) is assigned to each web (03, 04) of material.

27. The wheel folding apparatus in accordance with one of the preceding claims, characterized in that the transport cylinder (11) is embodied as a folding blade cylinder (11).

Abstract

A wheel folding apparatus with two cutting devices for cross cutting at least a first web of material is described. The cutting devices comprise cutting or counter cylinders, which can be rotated together and which, together with a transport cylinder, delimit gaps through each of which a transport track for a web of material extends. The transport cylinder or the cutting cylinder support at least one cutter for cutting a product off the webs of material as the cutter passes through one of the gaps. The transport cylinder has a holding device for holding a signature that has been cut off, and for transporting the signature through the respective gap. The transport cylinder or the counter cylinder have stops that work together with the cutter.